drop down prematurely. Mature bolls, when attacked, do not open properly, while lint from such bolls is usually stained yellow. The description of *X. malvacearum* (Erw. F. Smith) Dowson as determined by us is given below:—

Short rods with rounded ends, single or in pairs, rarely in chains, motile by a polar flagellum, gram-negative, not acid fast, capsulated, no spores, strict aerobe.

On potato dextrose agar, the colonies are round, smooth, glistening, butyrous, baryta yellow (Ridgway), convex, no distinctive odour, striations starting from midway coming upto the periphery, 2 cm. in diameter in 7 days. Starch attacked; hydrogen sulphide produced; litmus reduced; nitrates not reduced; produces acid but no gas from dextrose and galactose, but not from mannitol, lactose, raffinose and xylose. It makes no growth in Cohn's and Uschinsky's solutions; M.R.V.P. tests negative; Loeffler's blood serum not liquefied in 10 days; indol and ammonia not produced; optimum pH for growth 6·9 to 7·1; optimum temperature for growth 31-32° C. ; sodium chloride tolerant upto 2 per cent.; the thermal death point approximately 50° C.

Exotic cottons belonging to *Gossypium barbadense*, *G. purpurascens*, *G. hirsutum*, and *G. thurberi* groups are susceptible in the descending order while some Indian cottons belonging to *G. herbaceum* and *G. arboreum* groups are highly resistant. The organism failed to infect other Malvaceous plants. Further studies on the longevity of the pathogen in the soil and on the seeds, detailed physiology, reactions of Indian cottons, interspecific hybrids and possible methods of control are in progress.

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Plant Pathological Laboratory, College of Agriculture, Poona, *July* 2, 1948.

M. K. PATEL.
Y. S. KULKARNI.

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YELLOW MOSAIC OF LETTUCE

LETTUCE plants (*Lactuca sativa* Linn.) grown in the mycological area of this Institute during 1946-47, were found to be affected by yellow mosaic disease. In 1947-48, the disease appeared in a severe form and the percentage of infection varied from 50-80. The first visible symptom in the field is clearing of veins of the youngest leaves associated with pale yellow mosaic mottling. Later, the mosaic symptoms become more pronounced and the lamina gets distorted (Fig. 1). The old infected leaves are much thickened and leathery and have chlorotic areas along the margins. The inflorescence axes borne by diseased plants are not distorted but flowers are few in number. In severely infected plant leaves are not attractive enough to be used for table purpose and the disease thereby reduces their market value.

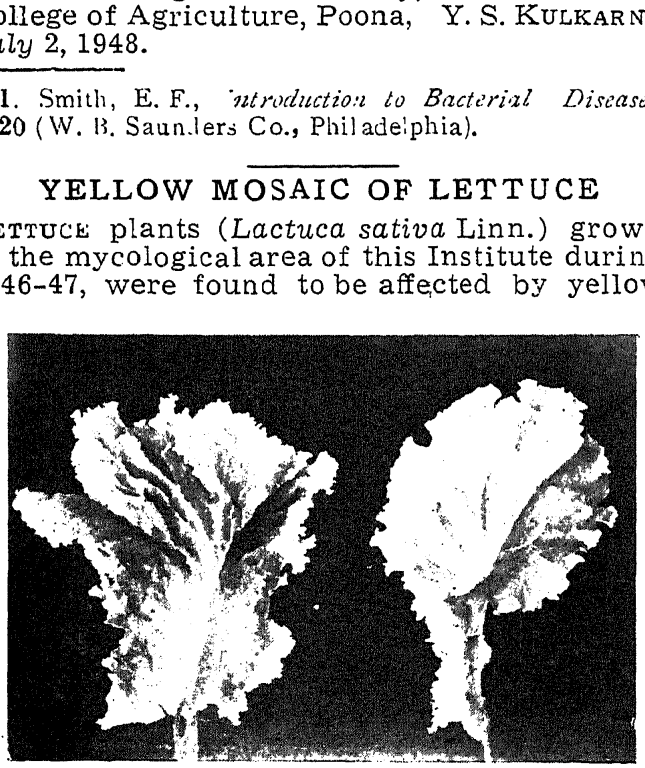

FIG. 1. Diseased leaves of lettuce affected by yellow mosaic virus.

Under glasshouse conditions in 6-8 days artificially inoculated lettuce plants develop small pale yellowish areas on the youngest leaves along with clearing of the veins. Distortion of the lamina and curvature of the midrib are commonly met with in older leaves. With age mosaic mottle becomes more pronounced and yellow areas on the upper surface of the lamina may be raised with a corresponding depression on the under-surface.

Transmission.—The virus is sap-transmissible. In 1946-47 about 5 per cent. of the plants raised under controlled conditions from seed obtained from the local market were found to be affected by yellow mosaic virus while in 1947-48, the percentage of infection in plants raised from seed of infected plants during the previous season was as high as 30.

Properties of the virus.—The properties of the virus were studied by inoculating young lettuce plants raised under insect-proof conditions with standard extract of the infected plants which had been subjected to different treatments.

The virus remains infective after an exposure for 10 minutes to 86° C., but it loses infectivity when exposed to 87° C. for the same period. The virus retains its infectivity after 60 days storage at room temperature (15°-25° C.) but is rendered innocuous after storage for 64 days. Crude juice of the infected plants when diluted to 1 : 60,000, was found to be infective whereas at 1 : 70,000, it becomes innocuous.

Host range.—The disease is transmissible besides lettuce to. *Nicotiana tabacum* varieties Harrison's special and *White Burley* and *Lycopersicum esculentum* var. Sutton's early market. Mottling and vein-thickening are the prominent symptoms in *N. tabacum* variety Harrison's special while in var. *White Burley* small elliptical pale yellow patches develop which become more pronounced in 25-30 days. Yellow mosaic mottle and thickening of the veins are the chief symptoms in tomato. Blistering, which is commonly seen in severely affected lettuce plants, is not met with in tobacco or tomato. All attempts to infect sweet pea plants with the virus were unsuccessful.

Jagger[1] reported a serious mosaic disease of lettuce from Sanford, Florida, and established its transmission through seed. It, however, differs from the virus studied at Delhi in having a thermal death-point of between 55° and 60° C., a longevity *in vitro* of 24 to 28 hours and extremely low dilution end-point.[2] Moreover, lettuce mosaic virus (*Lactuca* Virus 1)

is readily transmissible to sweet pea *Lathyrus odoratus* in which small brown lesions appear on the main stem.[3] Severin[4] and Linn[5] reported lettuce yellows disease caused by aster (*Callistephus chinensis*) yellows virus which results in yellowing, blanching and curling of the inner leaves; margins of these curled leaves develop small brown spots. Other virus diseases recorded on lettuce by Smith[2] are Dandelion yellow mosaic, cucumber yellow-mottle mosaic, tomato spotted Wilt and 'Big-vein'. Symptoms of all these appear to be different from yellow mosaic disease of lettuce now described.

Division of Mycology and Plant Pathology, Indian Aricultural Research Institute, New Delhi,
July 27, 1948.

R. S. VASUDEVA.
S. P. RAYCHAUDHURI.
P. S. PATHANIAN.

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A NEW BACTERIAL DISEASE OF *IPOMOEA MURICATA*

A NEW bacterial disease of *Ipomœa muricata* growing on the hedges and on the banks of river near Poona had been noticed for the first time in the rainy season of 1947. The disease is characterised by minute spots with bright yellowish areas which enlarge and involve a large part of leaves which become brown and brittle. Infection sometimes follows the veins and when severe, brings about distortion and wilting. Infection occurs through stomata or through vascular system and as such it resembles bean blight or cowpea blight. The pathogene has been isolated in pure state by ordinary plating method. The organism is new to science and hence has been assigned a specific rank.

Xanthomonas Uppalii sp. nov.—Rods with rounded end, 2·2 × 0·9 μ. Motile with a single polar-flagellum. Gram-negative. Non-capsulated. Not acid fast. No spores. Mostly single. Gelatin liquefied. Fair, smooth, dull, filiform lemon-chrome growth on nutrient agar. Litmus in milk reduced. Nitrites, ammonia and indol not produced. Hydrogen sulphide produced. No growth in Uschinsky's, Cohn's and Koser's uric acid media. Acetyl-methyl-carbinol not produced. Good growth with no acid and no gas in dextrose, lactose, sucrose, mannitol, raffinose, salicin and xylose. Levulose, arabinose not utilised. Starch hydrolysed. Strict aerobe. Optimum temperature 30° C. Thermal death point about 51° C.

Pathogenic on *Ipomœa muricata* but not on *I. batata, Phaseolus vulgaris, Dolichos lablab* and *Vigna catjang*. A detailed paper will shortly be published.

Plant Pathological Laboratory,
College of Agriculture, Poona, M. K. PATEL.
July 22, 1948.

ROLE OF PROTOZOA IN THE PURIFICATION OF SEWAGE BY "DILUTION"

IN view of our earlier observations on the role of certain forms of protozoa (more especially *Vorticellids*) in the purification of sewage in artificial tanks[1,2] and under certain conditions of land irrigation,[3] it was of interest to study the occurrence and development of such forms in raw sewage before treatment. Examination of some 500 samples of sewage derived from different sources showed (*a*) that they generally contained cysts of the protozoa commonly found in the purification tanks; (*b*) that the sources of the cysts were traceable to washings containing soil, such as sullage and storm water, discharged into the sewers; (*c*) that when the sewage was 'weak', considerable numbers of active protozoa were present; and (*d*) that when the sewage was 'strong' or was diluted with discharges of alkaline or acid wastes in such proportions as to affect appreciably the pH value of the medium (or when the sewage contained certain other trade effluents), no active protozoan was seen.

Continued observations extending over a period of ten years at the Institute sewage works (dealing with domestic sewage) have shown that flow of 'weak' sewage in the sewers facilitated the development of protozoa, such as the species of *Vorticella, Epistylis, Paramœcium* and other smaller ciliates and flagellates, including *Amœba*; that the sewage samples collected at the works were occasionally found to contain nitrite in amounts ranging from traces to about 0·02 parts per 100,000.

Experiments were carried out by diluting raw sewage in varying proportions and keeping these diluted samples in shallow basins (in glass basins of diameter 3¾″ and depth 2¼″, and in porcelain troughs of diameter 8½″ and depth 4½″) and by examining the contents of the basins at frequent intervals for the micro-organisms and the oxidation changes. It was observed that in the 'weak' and diluted samples of sewage large numbers of protozoa developed. The predominant forms of protozoa were *Vorticella* sp. and *Paramœcium* sp., the former generally predominating in the earlier stages (upto about 36 hours); and in the later stages (after about 72 hours) other forms of protozoa, such as *Acineta* sp. and *Stylonychia* sp., also developed. A brownish deposit or sludge was found to be formed more especially in the basins which contained considerable numbers of protozoan cells; when the supernatants in the basins were decanted off and fresh water was added to the settled sludges, increasing amounts of nitrite and nitrate were produced. Thus it is of considerable interest to note in this connection that while the numbers of protozoa that develop in a given volume of sewage depend upon the amount of organic matter and dissolved oxygen